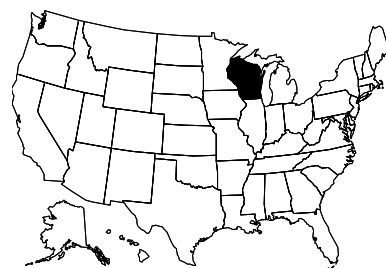


WISCONSIN

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Program Description

Historically, much of the water resource assessment work done by the Wisconsin Department of Natural Resources (WDNR) has focused on the evaluation of degraded watersheds or water resources with high public profile. As a result, there is a lack of data on the overall quality of Wisconsin's water resources. In addition, monitoring techniques often varied among assessment sites and over time thus making it difficult to compare data across the state or from different time periods. To address these concerns, WDNR initiated a new program in 1999, called Baseline Monitoring. Standardized assessment techniques for aquatic habitat, macroinvertebrates and fish have been developed and are being applied throughout the state. The elements of this new program are contained in a draft report on Wisconsin's Surface Water Monitoring Strategy.

The overall goals of the baseline monitoring strategy are to answer the following questions:

1. What are the use expectations for Wisconsin's water resources?
2. Are the state's waters meeting their use potential?
3. What factors are preventing the state's water resources from meeting their potential?
4. What are the statewide status and trends in the quality of Wisconsin's surface waters?

To achieve the goals of the program, the following specific set of monitoring objectives were established:

- Determine the designated attainable uses of each waterbody. Stream and lake habitat information and fisheries data collected during baseline assessments will be compared with biological criteria obtained from "least-impacted" regional reference waters to determine the water's use classification.
- Determine the level of use attainment of each waterbody. Stream habitat and fisheries data collected during baseline assessment monitoring will allow the WDNR to determine if designated uses are being attained. More emphasis is being placed on biological monitoring to determine if designated uses are being met.
- Determine why some waterbodies are not attaining their designated uses. Physical, chemical and biological data collected during baseline assessment monitoring will provide at least some of the information required to achieve this objective.

For stream biological monitoring, WDNR collects information on riparian and in-stream habitat data, aquatic insects and fish species. The aquatic insects are identified and the numbers of fish are determined using standardized collection protocols. Lake monitoring involves collecting trophic state data and fish community data using the standardized protocols.

WDNR will begin using a stratified-random sampling approach to achieve adequate coverage of the state's 55,000 miles of streams. This sampling design allows the WDNR to sample a variety of streams and lakes across the state and also provides the Department with the ability to evaluate the quality of water resources that have not been sampled. The WDNR collects over 400 aquatic invertebrate samples per year. However, under the baseline monitoring that was initiated last year, the WDNR is now annually assessing about 600 stream sites. In the future, maps showing the location of biological sampling sites will be available.

Documentation and Further Information

Wisconsin Water Quality Report to Congress, 2000 305(b): <http://www.dnr.state.wi.us/org/water/wm/watersummary/WQ.pdf>

Wisconsin's Unified Watershed Assessment: <http://www.dnr.state.wi.us/org/water/wm/watersummary/uwa/index.htm#intro>

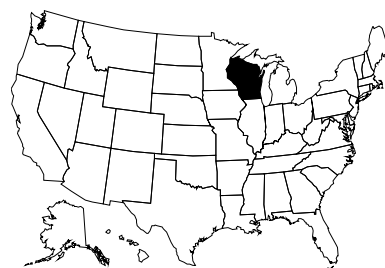
Water Quality Standards for Wisconsin Surface Waters, revised February 1998: <http://www.legis.state.wi.us/rsb/code/nr/nr102.pdf>

Wisconsin DNR Fisheries and Habitat Biological Database: http://infotrek.er.usgs.gov/wdnr_bio/

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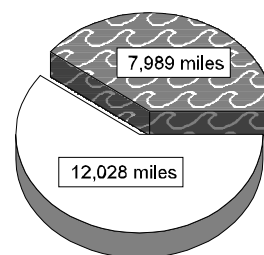
Programmatic Elements

Uses of bioassessment within overall water quality program	<input checked="" type="checkbox"/>	problem identification (screening)
	<input checked="" type="checkbox"/>	nonpoint source assessments
	<input checked="" type="checkbox"/>	monitoring the effectiveness of BMPs
	<input checked="" type="checkbox"/>	ALU determinations/ambient monitoring
	<input type="checkbox"/>	promulgated into state water quality standards as biocriteria
	<input checked="" type="checkbox"/>	support of antidegradation
	<input checked="" type="checkbox"/>	evaluation of discharge permit conditions
	<input checked="" type="checkbox"/>	TMDL assessment and monitoring
	<input checked="" type="checkbox"/>	other: fishery assessments, FERC re-licensing, decisions, etc.
Applicable monitoring designs	<input checked="" type="checkbox"/>	targeted (i.e., sites selected for specific purpose) <i>(special projects only)</i>
	<input checked="" type="checkbox"/>	fixed station (i.e., water quality monitoring stations) <i>(specific river basins or watersheds)</i>
	<input type="checkbox"/>	probabilistic by stream order/catchment area
	<input checked="" type="checkbox"/>	probabilistic by ecoregion, or statewide <i>(comprehensive use throughout jurisdiction)</i>
	<input type="checkbox"/>	rotating basin
	<input type="checkbox"/>	other:

Stream Miles

Total miles*	55,000
Total perennial miles	32,000
Total miles assessed for biology**	24,422
fully supporting for 305(b)	7,989
partially/non-supporting for 305(b)	12,028
listed for 303(d)	—
number of sites sampled <i>(on an annual basis)</i>	600
number of miles assessed per site**	5

24,422 Miles Assessed for Biology



- ☒ "fully supporting" for 305(b)
- ☐ "partially/non-supporting" for 305(b)

*Surface water resources for Wisconsin have been quantified using GIS. A 1:24,000 scale hydrography GIS database was developed by digitizing surface waters shown on USGS 7.5 minute quadrangle maps.

**The miles assessed for biology include fish consumption and aquatic life use. Of the 12,394 miles fully supporting for 305(b), 4,405 miles are threatened. Each site sampled represents 5 miles of stream for baseline surveys, based on research conducted by WDNR.

Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis	Fishery Based Uses and Warm Water vs. Coldwater	
ALU designations in state water quality standards	Five designations: 1) Coldwater – Salmonids & some sculpin species, 2) Warm Water Fish & Aquatic Life – game fish and some important forage species, 3) Warm Water Forage Fish – forage fish communities intolerant to low dissolved oxygen, 4) Limited Forage Fish – forage fish communities tolerant of low dissolved oxygen, 5) Limited Aquatic Life – communities with non-fish species (invertebrates, etc.) that are tolerant of low dissolved oxygen.	
Narrative Biocriteria in WQS	Wisconsin does not have narrative biocriteria per se. It does have narrative criteria that are applied to protect against harm to human, wildlife and fish and aquatic life communities. Please see below.*	
Numeric Biocriteria in WQS	none	
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	<input checked="" type="checkbox"/>	assessment of aquatic resources
	<input checked="" type="checkbox"/>	cause and effect determinations
	<input checked="" type="checkbox"/>	permitted discharges
	<input checked="" type="checkbox"/>	monitoring (e.g., improvements after mitigation)
	<input checked="" type="checkbox"/>	watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU	Wisconsin's bioassessment program is still evolving, but has been used regularly to make water quality management decisions that range from fishery management issues (bag limits, habitat restoration projects) to FERC license operating conditions to assessing potential vs. actual fish & aquatic life uses of surface waters.	

***Acute Narrative Criterion:** NR 102.04(1)(d) (d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

Chronic Narrative Criterion: NR 102.04(4)(d) (d) Other substances. Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. Surface waters shall meet the acute and chronic criteria as set forth in or developed pursuant to ss. NR 105.05 and 105.06. Surface waters shall meet the criteria which correspond to the appropriate fish and aquatic life subcategory for the surface water, except as provided in s. NR 104.02(3).

Reference Site/Condition Development

Number of reference sites	100 total	
Reference site determinations	<input checked="" type="checkbox"/>	site-specific
	<input type="checkbox"/>	paired watershed
	<input checked="" type="checkbox"/>	regional (aggregate of sites)
	<input type="checkbox"/>	professional judgment
	<input type="checkbox"/>	other:
Reference site criteria	Reference sites are defined by 1) BPJ using biota, 2) Upper quartile of biota index scores within two years, and 3) will eventually be supplemented with <i>a priori</i> land use. Also, a fish IBI is currently used, and habitat, water chemistry and macroinvertebrates will be incorporated within two years.	
Characterization of reference sites within a regional context	<input type="checkbox"/>	historical conditions
	<input checked="" type="checkbox"/>	least disturbed sites
	<input type="checkbox"/>	gradient response
	<input checked="" type="checkbox"/>	professional judgment
	<input checked="" type="checkbox"/>	other: will eventually use <i>a priori</i> GIS land use data
Stream stratification within regional reference conditions	<input checked="" type="checkbox"/>	ecoregions (or some aggregate)
	<input type="checkbox"/>	elevation
	<input checked="" type="checkbox"/>	stream type (<i>temperature, gradient, stream order</i>)
	<input type="checkbox"/>	multivariate grouping
	<input type="checkbox"/>	jurisdictional (i.e., statewide)
	<input checked="" type="checkbox"/>	other: will assess strata with multivariate analysis
Additional information	<input type="checkbox"/>	reference sites linked to ALU
	<input type="checkbox"/>	reference sites/condition referenced in water quality standards
	<input checked="" type="checkbox"/>	some reference sites represent acceptable human-induced conditions

Field and Lab Methods

Assemblages assessed	<input checked="" type="checkbox"/> benthos (>500 samples/year; single season, multiple sites - broad coverage) <input checked="" type="checkbox"/> fish (>500 samples/year; single season, multiple sites - broad coverage) <input checked="" type="checkbox"/> periphyton (<100 samples/year; single observation, limited sampling) <input type="checkbox"/> other:
Benthos	
sampling gear	Surber, Hess, D-frame (all limited use); 500 - 600 micron mesh
habitat selection	riffle/run (cobble)
subsample size	minimum of 125, but typically 200 - 300 organisms
taxonomy	lowest taxa-level possible - usually genus, sometimes combination
Fish	
sampling gear	backpack and boat electrofisher, pram unit (tote barge); 1/4" mesh
habitat selection	multihabitat
sample processing	length measurement, biomass- individual (gamefish), biomass- batch (non-game), anomalies
subsample	selected species
taxonomy	species
Periphyton	
sampling gear	natural substrate: brushing/scraping device (razor, toothbrush, etc.) artificial substrate: rock, rip-rap, bridge concrete
habitat selection	richest habitat
sample processing	chlorophyll a/ phaeophytin and taxonomic identification
taxonomy	diatoms only
Habitat assessments	quantitative measurements; performed with bioassessments
Quality assurance program elements	standard operating procedures, quality assurance plan, periodic meetings, training for biologists, sorting and taxonomic proficiency checks, specimen archival

Data Analysis and Interpretation

Data analysis tools and methods	<input checked="" type="checkbox"/> summary tables, illustrative graphs <input checked="" type="checkbox"/> parametric ANOVAs <input checked="" type="checkbox"/> multivariate analysis <input checked="" type="checkbox"/> biological metrics (<i>aggregate metrics into an index</i>)* <input checked="" type="checkbox"/> disturbance gradients <input type="checkbox"/> other:
Multimetric thresholds	
transforming metrics into unitless scores	25 th percentile of reference population
defining impairment in a multimetric index	25 th percentile of reference population
Evaluation of performance characteristics	<input checked="" type="checkbox"/> repeat sampling <input checked="" type="checkbox"/> precision (<i>repeat sampling of assessment sites is conducted</i>) <input checked="" type="checkbox"/> sensitivity (<i>multiple streams along various stressor gradients have been assessed to document metric sensitivity to the stressor of concern</i>) <input checked="" type="checkbox"/> bias (<i>Stream habitat assessment crews assess the same site to document crew experience bias. Least-impacted streams of differing size/stream order are sampled to document macroinvertebrate metric bias among streams of varying order</i>) <input checked="" type="checkbox"/> accuracy (<i>multiple least-impacted streams are sampled to document metric accuracy</i>)
Biological data	
Storage	A database has been developed in concert with USGS. It is not currently compatible with STORET. The database can be viewed at: http://www.infotrek.er.usgs.gov/wdnr_bio/
Retrieval and analysis	SAS, Systat, and Statistica. Also, an ORACLE-based data management system is being developed to store data and provide routine report summaries and metric calculations.

*Multimetric indexes for habitat and fish have been developed, and a multimetric index for macroinvertebrates is being developed.